

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Alexy V. Ustinov Confirmation No.: To be assigned
Serial No.: To be assigned Art Unit: To be assigned
Filed: Herewith Examiner: To be assigned
For: FLUXON INJECTION INTO ANNULAR JOSEPHSON JUNCTIONS Attorney Docket No.: 11090-064-999

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:
 - 1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.
 - 1b. A legible copy of :
 - ☐ Each U.S. patent application publication and U.S. and foreign patent;
 - ☐ Each publication or that portion which caused it to be listed on the PTO-1449;
 - ☐ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;
 - ☐ all other information or portion which caused it to be listed on the PTO-1449.
 - 1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.
 - 1d. ☐ Explanations of relevancy (ATTACHMENT 1(d), hereto) or English language abstracts of the non-English language publications.
2. ☒ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):
 - ☒ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);
 - ☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;

- ☐ Before the mailing of the first Office action on the merits;
- ☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.
3. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

(Check either Item 3a or 3b)

- 3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.
- 3b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is:
- ☐ enclosed
- ☐ to be charged to Pennie & Edmonds LLP Deposit Account No. 16-1150.

(Item 3b to be checked if any reference known for more than 3 months)

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

The \$180.00 fee set forth in 37 C.F.R. §1.17(p) is:

- ☐ enclosed.
- ☐ to be charged to Pennie & Edmonds LLP Deposit Account No. 16-1150.

The Certification Statement in Item 5 below is applicable.

5. ☐ Certification Statement (applicable if Item 3a or Item 4 is checked)

(Check either Item 5a or 5b)

- 5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.
- 5b. ☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.
- 5c. ☐ Pursuant to 37 C.F.R. §1.704(d), each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.
6. ☐ This application is a continuation application under 37 C.F.R. §1.60 or §1.53(b) or (d).

(Check appropriate Items 6a, 6b and/or 6c)

- 6a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.
- 6b. ☒ Copies of publications listed on Form PTO-1449 from prior application Serial No. 10/117,696, filed on April 4, 2002, of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).
- 6c. ☐ Copies of the publications listed on Form PTO-1449 were not previously cited in prior application Serial No. , filed on , and are provided herewith.
7. ☐ This is a Supplemental Information Disclosure Statement. (Check Item 7a)
- 7a. ☐ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on . A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on .
8. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:
- (Check Item 8a, 8b, or 8c)
- 8a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.
- 8b. ☐ set forth in the application.
- 8c. ☐ enclosed as an attachment hereto.
9. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Pennie & Edmonds LLP Deposit Account No. 16-1150.
10. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

Brett J. Williams Reg No. 42,813

Date: September 26, 2003

Gary S. Williams
PENNIE & EDMONDS LLP
3300 Hillview Avenue
Palo Alto, California 94304
(650) 493-4935

31,066
(Reg. No.)

LIST OF REFERENCES CITED BY APPLICANT (Use several sheets if necessary)	ATTY DOCKET NO.	APPLICATION NO
	11090-064-999	To be assigned (divisional of 10/117,696)
	APPLICANT Ustinov	
	FILING DATE Herewith	GROUP To be assigned

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	A01	3,936,677	3/3/1976	Fulton et al.			
	A02	4,181,902	1/1/1980	Alwyn C. Scott			
	A03	4,749,888	6/7/1988	Sakai et al.			
	A04	5,323,344	6/21/1994	Katayama et al.			
	A05	5,683,967	11/1/1997	Anatoly Frenkel			
	A06	6,331,805	12/1/2001	Gupta et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION
							YES NO
	B01	JP60170275	9/31/1985	Japan			
	B02	JP5190922A2	7/3/1993	Japan			
	B03	WO 02/15290 A1	2/21/2002	WIPO			

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

C01	L. G. Aslamazov and E. V. Gurovich, Pis'ma Zh. Eksp. Teor. Fiz. 40, 22 (1984) [Soviet Physics] JETP Letters 40, 746 (1984)
C02	F. Benatti et al., "Testing Macroscopic Quantum Coherence", IL Nuovo Cimento B 110, N. 5-6, pp. 593-610 (1/19/1995).
C03	J. Bindslev et al., "Low frequency noise in resonant Josephson soliton oscillators", IEEE Trans. Mag., 27, 3343 (3/1/1991).
C04	M. Bocko et al., "Prospects for quantum coherent computation using superconducting electronics", IEEE Transactions on Applied Superconductivity 7, 3638 (6/1/1997).
C05	J. Caputo, "Effect of geometry on-fluxon width in a Josephson junction", International Journal of Modern Physics C 7(2), 191, (1996).
C06	G. Carapella, "Relativistic flux quantum in a field-induced deterministic ratchet" Physical Review B 63 054515 (2001).
C07	M. Castellano et al., "Thermally activated escape from the zero-voltage state in long Josephson junctions", Physical Review B, 54(21), 15417 (12/1/1996).
C08	L. Chiatti et al., "Is Macroscopic Quantum Coherence Incompatible with Macroscopic Realism?", IL Nuovo Cimento B 110, N. 5-6, pp. 585-591 (1/19/1995).
C09	M. Cirillo et al., "Dynamical evidence of critical fields in Josephson junctions", PRB, 56, 11889 (11/1/1997).
C10	A. Davidson, et al., "Experiments on soliton motion in annular Josephson junctions", Journal Applied Physics 60, 1447 (8/1/1986).
C11	A. Davidson et al., Experimental investigation of trapped Sine-Gordon solitons", Physical Review Letters 55, 2059 (11/4/1985).
C12	David P. DiVincenzo, "The Physical Implementation of Quantum Computation", in <i>Scalable Quantum Computers: Paving the Way to Realization</i> (S. Braunstein et al. eds., Wiley-VCH Verlag, 2001).
C13	T. Drose and C. Morais-Smith, "Metastability in Josephson transmission lines", Physical Review B 61, 1506 (2000).

EXAMINER	DATE CONSIDERED
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

LIST OF REFERENCES CITED BY APPLICANT (Use several sheets if necessary)	ATTY DOCKET NO. 11090-064-999	APPLICATION NO To be assigned (divisional of 10/117,696)
	APPLICANT Ustinov	
	FILING DATE Herewith	GROUP To be assigned

OTHER REFERENCES <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>		
C14	Marc Feldman, "Josephson Junctions Digital Circuits - Challenges and Opportunities", [published in Japanese] in FED Review, FED Superconducting Project: Josephson Device Hybrid System (FED, Tokyo, 1998) pp. 23-46. [This manuscript was submitted in English (1/2/1998) for Translation to Japanese.]	
C15	A. Filippov, et al., "Critical currents in Josephson junctions with microinhomogeneities attracting solitons", Physics Letters A 120, 47 (1987).	
C16	M. V. Fistul and G. F. Giuliani, "Critical current of a long Josephson junction in the presence of a perturbing Abrikosov vortex", Physical Review B 58, 9343 (1998).	
C17	M. Fistul et al., "Escape of a Josephson vortex trapped in an annular Josephson junction", Physica B, 284-288, 585-586 (2000).	
C18	A. Franz et al., "Magnetic field penetration in a long Josephson junction imbedded in a wide stripline", Journal Applied Physics 89, 471 (2000).	
C19	A. Franz et al., "Measurements of the critical current diffraction patterns in annular Josephson junctions", Physical Review B 62(1), 119 (7/1/2000).	
C20	J. Friedman et al., "Quantum super-position of distinct macroscopic states", Nature 406 (7/6/2000).	
C21	F. Gaitan, "Berry phase modification of the current drive in a restricted class of large annular Josephson junctions at low temperature", Physical Review B 63, 104511-1 (2001).	
C22	E. Goldobin, A. Wallraff, N. Thyssen, and A. V. Ustinov, "Cherenkov radiation in coupled long Josephson junctions", Physical Review B 57, 130 (1998).	
C23	E. Goldobin, A. Sterk and D. Koelle, "Josephson vortex in a ratchet potential: Theory", Physical Review E 63, 031111 (2001).	
C24	D. Gupta and Y. Zhang, "On-Chip Clock Technology for Ultrafast Digital Superconducting Electronics", Applied Physics Letters 75, pp. 3819-3821 (2000).	
C25	Z. Hermon et al., "Dephasing length and coherence of a quantum soliton in an ideal long Josephson junction", Physical Review Letters 74(24), 4915 (6/12/1995).	
C26	V. Kaplunenko, V. Borzenets, N. Dubash, and T. Van Duzer, Applied Physics 71, pp. 128-130 (1997).	
C27	T. Kato and M. Imada, "Macroscopic quantum tunneling of a fluxon in a long-Josephson junction", Journal Physical Society Japan 65(9), 2963 (9/1/1996).	
C28	S. Keil et al., "Magnetic flux pinning in annular Josephson junctions in a barrier parallel dc magnetic field", Physical Review B 54(21), 14948 (12/1/1996).	
C29	A. Kemp et al., "Critical current diffraction patterns for annular Josephson junctions in dependence of the direction of the field", Conference on Future Perspectives of Superconducting Josephson Devices, Acquafredda di Maratea, Italy (7/1/2000).	
C30	Y. Kivshar and B. Malomed, "Interaction of a fluxon with a local inhomogeneity in a long Josephson junction", Physics Letters A 129, 443 (6/1/1988).	
C31	Yu, Koval et al., "Narrow long Josephson junctions", IEEE Transactions on Applied Superconductivity, Volume: 9 Issue: 2 Part: 3, 3957 (1999).	
C32	Y. Makhlin, G. Schön and A. Shnirman, "Quantum-State Engineering with Josephson-Junction Devices", Reviews of Modern Physics, Vol. 73, 357 (2001).	
C33	B. Malomed, "Dynamics of a fluxon in a long Josephson junction with a periodic lattice of inhomogeneities", Physical Review B 38, 9242 (11/1/1988).	
C34	B. Malomed and A. Ustinov, "Analysis of testing the single-fluxon dynamics in a long Josephson junction by a dissipative spot", Physical Review B 49, 13024 (5/1/1994).	
C35	N. Martucciello and R. Monado, "Annular Josephson tunnel junctions in an external magnetic field: the statics", Physical Review B 53(6), 3471 (2/1/1996).	

EXAMINER	DATE CONSIDERED
-----------------	------------------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

LIST OF REFERENCES CITED BY APPLICANT (Use several sheets if necessary)	ATTY DOCKET NO. 11090-064-999	APPLICATION NO To be assigned (divisional Of 10/117,696)
	APPLICANT Ustinov	
	FILING DATE Herewith	GROUP To be assigned

OTHER REFERENCES <i>(Including Author, Title, Date, Pertinent Pages, Etc.)</i>		
C36	N. Martucciello et al., "Annular Josephson tunnel junctions in external magnetic field: the dynamics", Physical Review B 55(22), 15157 (6/1/1997)	
C37	N. Martucciello et al., "Fluxon dynamics in long annular Josephson tunnel junctions", Physical Review B 57(9), 5444 (3/1/1998).	
C38	J. Mooij et al., "Josephson persistent-current qubits", Science, 285, 1036 (8/13/1999).	
C39	D. Munter et al., "Fluxon pinning through interaction with the superconducting wiring of long annular Josephson junctions", Physical Review B 58, 14518 (12/1/1998).	
C40	Y. Nakamura et al., "Coherent control of macroscopic quantum states in a single-Cooper-pair box", Nature 398, 786 (4/29/1999).	
C41	C. Nappi et al. "Fiske steps in annular Josephson junctions with trapped flux quanta", Physical Review B 58(17), 11685 (11/1/1998).	
C42	C. Nappi, "Critical-current diffraction pattern of annular Josephson junctions", Physical Review B 55(1), 82 (1997).	
C43	K. Neurohr et al., "Local suppression of J. currents in niobium/2-D e-gas/niobium structures by an injection current", Physical Review B 59, 11197 (5/1/1999).	
C44	T. Orlando et al., "A superconducting persistent current qubit", Physical Review B 60, 15398 (12/1/1999).	
C45	N. Pederson, "Fluxon electronic devices", IEEE Transactions Magnetics 27, 3328 (3/1/1991).	
C46	V. Plerou and F. Gaitan, "Dynamic interplay of Berry's phase and spectral flow in the current-voltage characteristics of a restricted class of large SNS annular Josephson junctions", Physical Review B 63, 104512-1 (2001).	
C47	H. Pressler, "Fluxon bunching in Josephson tunnel junctions", Physics Letters A 244, pp. 149-154 (7/13/1998).	
C48	A. Shnirman et al., "Tunneling and resonant tunneling of fluxons in a long Josephson junction", Physical Review B 56, 14677 (12/1/1997).	
C49	A. V. Ustinov, Pis'ma Zh. Eksp. Teor. Fiz. 64, 178 (1996) [Soviet Physics JEP Letters 64, 191 (1996)].	
C50	A. V. Ustinov, T. Doderer, R. P. Huebener, N. F. Pedersen, B. Mayer and V. A. Oboznov, "Dynamics of sine-Gordon solitons in the annular Josephson junction", Physical Review Letters 69, 1815-1818 (1992).	
C51	A. V. Ustinov, T. Doderer, B. Mayer, R. P. Huebener and V. A. Oboznov, "Trapping of several solitons in annular Josephson junction", Europhysics Letters 19, 63-68 (1992).	
C52	A. Ustinov et al., "Soliton trapping in a harmonic potential: experiment", Physics Letters A 233, 239 (1997).	
C53	A. Ustinov and N. Thyssen, "Experimental study fluxon dynamics in a harmonic potential well", Journal of Low Temperature Physics 106, 193 (1997).	
C54	A. Ustinov et al., "Dynamics of sine-Gordon solitons in the annular Josephson-junction", Physical Review Letters 69(12), 1815 (1992).	
C55	A. Ustinov, "Solitons in Josephson junctions", Physica D 123, 315 (1998).	
C56	I. Vernik et al., "Observation of supersoliton resonances in the modulated annular Josephson junction," Physics Letters A 168, 319 (1992).	
C57	I. Vernik et al., "Fluxon pinning in annular Josephson junctions by an external magnetic field", Journal Applied Physics 81(3), 1335 (1997).	
C58	I. Vernik et al., "Soliton bunching in annular Josephson junctions", Journal Applied Physics 79, 7854 (5/1/1996).	
C59	A. Vystavkin et al., "First observation of static bound states of fluxons in long Josephson junctions with inhomogeneities", Soviet Journal Low Temperature Physics 14, 357 (6/1/1988).	
C60	A. Wallraff "Fluxon Dynamics in annular Josephson junctions: From relativistic strings to quantum particles", PhD thesis, University of Erlangen-Nurnberg, Germany (2000).	

EXAMINER	DATE CONSIDERED
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

LIST OF REFERENCES CITED BY APPLICANT
(Use several sheets if necessary)

ATTY DOCKET NO.

11090-064-999

APPLICATION NO

To be assigned (divisional
of 10/117,696)

APPLICANT

Ustinov

FILING DATE

Herewith

GROUP

To be assigned

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

C61	A. Wallraff et al., "Annular long Josephson junctions in a magnetic field: Engineering and probing the fluxon potential", Journal Low Temperature Physics 118(5/6), 543 (2000).
C62	A. Wallraff et al., A. V. Ustinov, V. V. Kuring, J. A. Shereshevsky and N. K. Vdovicheva, "Whispering Vortices", Physical Review Letters 84, 151 (2000).
C63	Y. Zhang and D. Gupta, "Low -jitter on-chip clock for RSFQ circuit applications", Superconducting Science & Technology 12, 769-772 (1999).

EXAMINER**DATE CONSIDERED**

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with **MPEP 609**; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.